

Section 2 Executive Summary

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Executive Summary

This section summarizes the *Kanab Creek/Virgin River Basin Plan*. Like the *State Water Plan*, this document contains 19 sections including this summary. In addition, the *State Water Plan* contains Section 20, "River Basin Summaries," and Section 21, "Annual Status Report."

The following headings are titles of each of the sections summarized. These sections should be studied for more detailed information.

2.1 Foreword

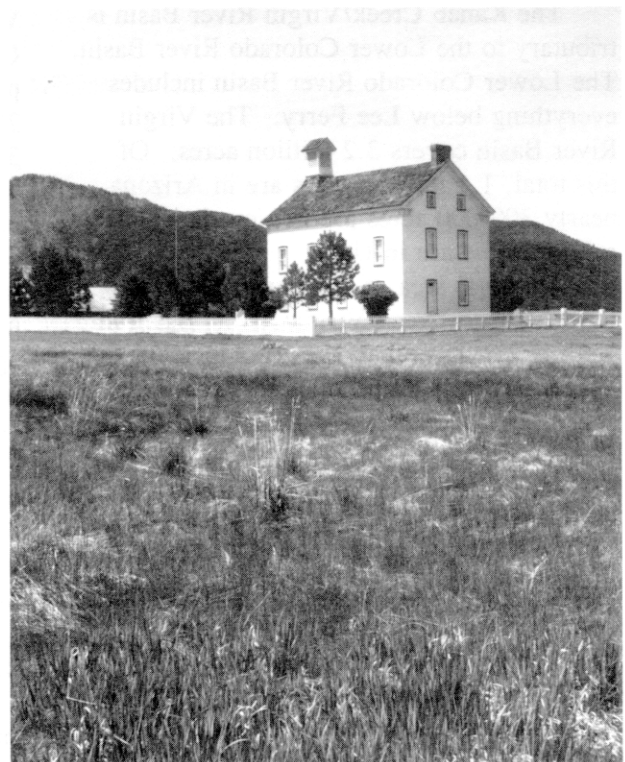
Within the broad responsibility to enhance the quality of life and general welfare of its citizens, the state of Utah has the specific obligation to plan for and encourage the best use of its resources. The *State Water Plan* (1990) provides the statewide foundation and direction. More detailed plans are and will be prepared for the 11 hydrologic basins. The *Bear River Basin Plan* was published in January 1992. This plan for the Kanab Creek/Virgin River Basin is the second report to be completed.

The purpose of this plan is to identify potential conservation and development projects and describe alternatives to satisfy the problems, needs

and demands. The final selection of alternatives will be made at the local level.

2.3 Introduction

Section 3 contains the general planning



guidelines used to insure continuity during basin plan preparation. The guidelines consist of guiding principles, purpose, organizational structure and review process. The organizational arrangements provide contribution and review opportunities for state and federal agencies, special interest groups and especially local entities, organizations and individuals. The planning process allows for review and approval at various stages of completion. This section also discusses the settlement, climate, general physical characteristics and land status of the Kanab Creek/Virgin River Basin. Since the first settlements in the early 1850s, many changes have occurred. The mild climate has contributed to much of this.

The Kanab Creek/Virgin River Basin is tributary to the Lower Colorado River Basin. The Lower Colorado River Basin includes everything below Lee Ferry. The Virgin River Basin covers 3.2 million acres. Of this total, 1.1 million acres are in Arizona, nearly 300,000 acres are in Nevada and 1.8 million acres are in Utah.

The total area of the Lower Colorado River (Kanab Creek/Virgin River) Basin in Utah is 2.2 million acres. This includes the Virgin River, 1.8 million acres; Johnson Wash, 211,000 acres and Kanab Creek, 189,000 acres.

Mean annual valley temperatures vary from 45° to 61° F. Summer temperatures over 110° F are not uncommon. Precipitation ranges from six inches in the desert areas to 35 inches in the high mountains. Elevations range from 2,297 feet to 10,375 feet above sea level.

The area is marked by colorful cliffs and plateaus on the east to broad valleys and mountains on the west. Pinyon/juniper and

mountain shrubs are the primary vegetation. These cover nearly one-third of the area with rockland accounting for 15 percent. There are 25,600 acres of irrigated cropland.

The federal government administers over two-thirds of the total area and the state about eight percent. About 23 percent of the land is in private ownership and 1.3 percent is tribal lands.

2.4 Demographics and Economic Future

Population, employment and the economy are discussed in this section. This is an area of rapid growth. The 1990 and projected 2020 populations follow with the latter in parentheses. The basin population is 52,742 (158,381); 47,401 (147,438) in Washington County, 4,843 (10,553) in Kane County and 228 (410) in Iron County. At present, the largest cities are: St. George, 28,502; Washington, 4,198; Hurricane, 3,915 and Kanab, 3,289. The growth rate will be an estimated 3.4 percent per year compared to 1.7 percent for all of Utah.

The major growth sectors are transportation, communications, public utilities and service. All sectors except agriculture are expected to grow at about four percent annually. Agricultural employment is expected to continue its decline. Southwestern Utah will grow as an economic force. This will come through recreation, retirement living and tourism along with some industrial and manufacturing expansion.

2.5 Water Supply and Use

Section 5 discusses the historical water supplies and present uses. The surface water supplies are estimated primarily from three stream gages. They indicate the long-term

annual flows at Virgin River near Littlefield, 169,970 acre-feet; Virgin River near Virgin, 130,610 acre-feet and Kanab Creek near Kanab, 9,300 acre-feet. The highest year in the basin was 1922 with 337,000 acre-feet near Virgin. The long-term average annual groundwater discharge in the Virgin River basin is 155,000 acre-feet. The groundwater discharge in Kanab Creek and Johnson Wash drainage area is 22,000 acre-feet annually, with about 5,000 acre-feet of this being outflow into Arizona.

Total water diversions are culinary, 20,330 acre-feet; secondary, 15,960 acre-feet and irrigation, 123,300 acre-feet for a total of 159,590 acre-feet. Total depletions for these uses are 73,050 acre-feet. Wetland and riparian vegetation uses are not included.

2.6 Management

The water in the basin is generally well managed to serve the various uses. Two



areas of concern, however, are instream flow requirements and potential storage reservoirs.

Nearly 70 percent of the total water supply is managed by a combination of 35 irrigation companies with an additional one-third of the irrigated area water supply under private systems. There are 78 drinking water systems, 35 of which are classified as "Public Community" suppliers.

Managers of water delivery systems are concerned with maintaining and/or improving facilities. Increasing water use efficiencies and maintaining water quality are always major concerns.

2.7 Regulation/Institutional Considerations

The responsibility for water regulation rests primarily with two state agencies. These are the Division of Water Rights and the Department of Environmental Quality.

Proposed determinations of water rights have been made for all areas in the basin. It is difficult to predict when decrees will be entered by the courts. In addition, claims for reserved water rights need to be resolved.

Water quality is always a concern. Constant vigilance is needed to maintain the quality of surface water and groundwater. An expanded monitoring program will help control water quality.

2.8 State, Federal and Local Water Resources Funding Programs

This section discusses the funding programs available. Funding can be either grants or loans at various interest rates. These funding resources are available for all kinds of water-related proposals.

The time periods reported by the agencies vary but the total funds expended are impressive. The state and federal grants are over \$120 million and loans are nearly \$59 million for a total of \$179 million. Data from local sponsor funding including private financial institutions are not available.

2.9 Water Planning and Development

Section 9 discusses the water resources problems and needs. Development and management alternatives are described for surface water and groundwater.

Considerable controversy has developed over the proposed development and use of existing water resources. As a result, three policy issues are presented in the plan. These are concerned with potential reservoir sites, wilderness areas and long-range plans.

Because of the demand for water to meet the needs of projected population growth, new water storage and delivery facilities have been proposed. These proposals have invoked objections by special interest groups seeking to preserve and protect the area in its present state. This, coupled with proposed wilderness areas where no development is allowed, could severely restrict future development. The need for long-range plans is clear.

Based on population projections, the demand for culinary and secondary water supplies will increase over four times by 2040. This amounts to diversions of 82,710 acre-feet and 65,030 acre-feet, respectively, by 2040.

Agricultural water use has remained fairly constant. Future development will displace some presently irrigated farm land. This will make irrigation water available for other uses.

The demands and needs for water-based recreation and water for fish and wildlife will increase. Recreation activity should increase at about the same rates as population. Fish and wildlife needs will increase at a slower rate.

Only four areas are still open for groundwater development. These are Kanab Creek, Johnson Wash, an area southwest of Hurricane and Beaver Dam Wash. The primary aquifer is the Navajo sandstone with an estimated storage of several million acre-feet of recoverable water. Studies are needed to determine if additional water can be developed without mining taking place. There are some opportunities for artificially recharging this aquifer so groundwater use can be increased.

Another alternative is to upgrade the conveyance and delivery systems. Diversions for agricultural use can be reduced by increasing delivery efficiency. This can be accomplished by installing pipelines, canal lining, water control facilities and management methods. Deteriorated public water supply systems can be upgraded by replacing leaking pipes, constructing needed storage tanks and installing other required facilities.

Additional water storage reservoirs will be needed to meet the projected basin needs, primarily municipal and industrial supplies. Over 100 sites have been investigated at various levels of detail. Through a series of evaluations, about two-thirds of these were eliminated because they were not technically or economically feasible. There are also additional sites that could be evaluated in the future.

Water supply management strategies can also increase the available water supplies. One of the major management tools is

computer modeling. This can be used to simulate flow and effects of existing and proposed reservoirs. Another management tool to increase the water supply is cloud-seeding.

Depletions occur in five major categories. The current and projected depletions to the year 2040 in acre-feet are culinary, 10,570 and 51,280; secondary, 11,170 and 45,520; irrigation, 51,300 and 37,600; exports, 2,600 and 9,100 and reservoir evaporation, 5,300 and 8,400.

2.10 Agricultural Water Conservation and Development

This section discusses the agricultural aspects of the basin. Agricultural activities, although decreasing, are still an important part of the economy.

Total area of all agricultural lands is about two million acres. Less than two percent of the total land area is used as cropland, although six percent have soils suitable for cultivation. The balance is used for grazing. There are over 90,000 AUMs of livestock grazing with nearly 50,000 AUMs allocated for wildlife.

Irrigated cropland covers 25,600 acres and depletes 51,300 acre-feet of water annually, mostly for alfalfa and pastures. Most of the crop production is used to support the livestock industry although some alfalfa is exported. There are about 3,000 acres of irrigated cropland in Arizona and 4,000 acres in Nevada in the Kanab Creek and Virgin River drainages. Dry cropland covers about 21,300 acres.

There are critical erosion areas throughout the basin. These areas are eroding at over three times the background geologic rate, primarily because the watershed range condition is poor. Water

deficits on irrigated cropland are 19,000 acre-feet or 37 percent of the average depletion. It is estimated about 7,000 acres of irrigated cropland will be lost to other uses by the year 2040.

There are various alternatives for solving problems including canal lining and pipelines, reservoir storage and rangeland improvement measures. Increasing resource use efficiencies is always a viable option.

2.11 Drinking Water Supplies Development and Management

Section 11 discusses the drinking water systems, their problems and the future needs. The systems are publicly or privately owned. Groundwater is the primary source. The basin-wide use is 350 gallons per capita per day (GPCD). This is higher than the state average of 284 GPCD. The GPCD use ranges from 147 in Virgin and 152 in Glendale to 389 in Washington City.

There are 78 drinking water systems in the basin; 35 of these are classified as public community systems. Of the 35 public community systems, 28 are approved, two are not approved and five are pending corrective action.

Most public water suppliers expect an increase in demand of 40-60 percent to over double the current use of 20,330 acre-feet annually in the next 30 years. Over 90 percent of the increased demand will occur in Washington County. If conservation is applied, the use would decrease.

Meeting the projected growth will require long-range planning and development. More surface water will be used requiring storage facilities and treatment plants. Groundwater development

still holds promise, particularly in the Navajo sandstone aquifer.

2.12 Water Pollution Control

Section 12 discusses the water quality of the basin along with the problems and needs. Most of the groundwater in the basin is of good quality. The Navajo sandstone is the major aquifer, supplying most of the municipal and industrial water supplies. Many of the recharge areas for this aquifer have been identified to aid local governments in preparing protection strategies. The alluvial aquifers are also vulnerable to pollution and need to be protected. Surface water quality is usually better in the upper reaches of the streams and gradually deteriorates downstream. Total dissolved solids are the primary pollutant. La Verkin (Pah Tempe) Springs produces flows containing about 9,000 mg/l total dissolved solids. This effects all downstream uses of the Virgin River.

In order to maintain or improve the water quality, ongoing planning and monitoring programs are needed. Protection of upper watershed areas is needed to reduce pollutant contributions to water supplies. Pollution can be controlled by local government entities being involved. They can work with state agencies to implement groundwater protection programs. Federal programs are also available to help reduce pollution.

2.13 Disaster and Emergency Response

Flood hazard mitigation and disaster response programs are discussed in Section 13. It also discusses associated problems and needs. Flooding and drought are the major water-related emergencies.

Some of the communities have hazard mitigation and disaster response plans. All of the local governments need those type plans in place. If disaster preparedness plans and staff are ready, damages can be reduced and lives can be saved. It is much easier to be ready before an event than to correct the problems after something happens.

Floods of various sizes have been recorded since the area was settled. The largest flow was in December 1966 on the Virgin River. The Kanab Creek peak flow was in September 1961.

Droughts are a frequent occurrence. These are aggravated because most of the basin is below 7,000 feet elevation making the winter snow packs small.

Flood control structures on tributary streams are effective for reducing damages from local cloud burst storms. Installation of non-structural flood prevention measures in the upper watershed areas can have the greatest long-term effects. Large water storage facilities can alleviate the effects of droughts as well as floods. There are potential sites, such as one on Quail Creek, that should be considered for flood control on many of the drainages. Weather modification and groundwater development are alternatives for drought relief.

Disaster response plans are the most effective way to prepare for emergency situations. This is true at the county and community level as well as for families and individuals.

2.14 Fisheries and Water-Related Wildlife

Section 14 discusses the fish and wildlife resources of the basin along with the problems, needs and some alternative solutions. The range in environments varies

from alpine to the Mojave Desert with wildlife species found accordingly. Several threatened and endangered species are found in the area. Because of the threatened and endangered fish, instream flows have become an item of considerable importance. The dry climate has also contributed to the impact of development on the wetlands and riparian habitat.

Many environmental problems are the result of the rapidly expanding population centers. This is going to increase the conflicting demands for water to support increasing numbers of people and maintaining fish and wildlife habitat.

Cold water fisheries are found in the upper reaches of the rivers and streams. Reservoirs in these reaches also provide trout fishing. The lower areas provide warm water fisheries in the streams and reservoirs. Several species of native fishes are found in the warm water fisheries. These include the endangered roundfin minnow and the Virgin River roundtail chub, found only in the Virgin River.

Mitigation is needed whenever changes are made in the fish and wildlife habitat. When reservoir storage projects are constructed, consideration should be given by those interested to purchase conservation pools or storage water to provide fish habitat. Rehabilitation or replacement of disturbed areas may also be needed. Preservation of riparian areas can be accomplished by providing other watering sources for wildlife and livestock. Streams supporting riparian habitat can also be enhanced by small structural measures.

2.15 Recreational Aspects of Water Development

The importance of recreation and related facilities are presented in Section 15 along with problems and needs. Recreation is becoming a major part of the basin's lifestyle. The area offers a diversity of outdoor recreational opportunities because of the variety of topography, climate and vegetation. The area contains four state parks, one each national park and national forest, two wilderness areas and many camping areas and RV sites. There are several byways and backways for those wanting more solitude. Development of non-motorized trails and riverways is continuing. Over \$2 million has been cost-shared on 14 projects in Washington County.

Within the Utah State Comprehensive Outdoor Recreation Planning (SCORP) process, surveys are conducted to determine the priority of recreational and environmental issues to be addressed. It was noted over 50 percent of all tourists visiting Utah pass by St. George and Cedar City on I-15. More of them need to be aware of the area's attractions. Many of the issues concerned funding. There is a need for more and stable funding sources. Key recreation areas need to be linked together to provide a wider array of opportunities. The natural environment plays an important part in the overall recreation scene. The most desirable recreational activities are either water-based or water-related.

The importance of recreation is evidenced by increasing use of developed state park areas with an increase of 16 percent visitation during the period 1984-91. Visitation increased in Zion National Park to over 2.5 million in 1991, up 48 percent

since 1985. Similar increases have occurred in other areas.

2.16 Federal Planning and Development

Section 16 describes the federal involvement in basin planning and development. The federal role is changing. Many of the past activities concerned development of the resources. Concerns now are more oriented around conservation and protection. The federal role has been and will continue to be a vital part of the basin's resources use and development.

The main concern is the part federal agencies should play compared to state and local involvement. There is a definite need for coordinated planning and use. With the large amount of land area administered by the federal government, local needs and desires become even more important.

The Dixie Project was the most extensive planning effort by the Bureau of Reclamation. Additional studies were carried out in Kanab Creek. The Corps of Engineers has completed flood studies in the Virgin River drainage. The largest construction project is the Warner Draw Watershed Project by the Soil Conservation Service in cooperation with local sponsors and state and other federal agencies. It is primarily for flood control and irrigation water management.

Other Department of Agriculture and Interior agencies administer large areas of land for multiple use of the resources with the exception of Zion National Park which is a single purpose use. The Department of Agriculture also furnishes financial and technical assistance through water-related programs. The Fish and Wildlife Service is actively involved carrying out the

Endangered Species Act. The U.S. Geological Survey has and is continuing to carry out groundwater studies and water monitoring programs.

2.17 Water Conservation

The importance of water conservation along with the need for and ways of conserving this resource are discussed in Section 17. Water conservation can alleviate the effects of drought by stretching available supplies. A system-wide long-term conservation program can extend the need for developing additional water supplies and increasing the delivery capacities. Conservation can also carry communities through short-term water emergencies. Installing secondary systems for outside uses can reduce the need for increased high quality water supplies. In the long term, water education is the key to conservation through more efficient use.

The two major uses of water are for municipal and industrial (M&I) and agricultural purposes. Reducing M&I uses by 50 gallons per capita day could save 56 acre-feet per 1,000 population annually. In St. George alone, this would have saved 1,700 acre-feet in 1990.

Agricultural water can be conserved with efficient delivery systems and on-farm practices to reduce waste. If the overall irrigation efficiency could be increased one percent, it would save 2,500 acre-feet of water in the basin.

Water conservation will require the input and support of the public. Programs are best carried out under the auspices of water suppliers. If everyone believes in water conservation, it will happen.

2.18 Industrial Water Use

Section 18 discusses industrial water uses in the basin. There is relatively little water used for industrial uses other than light industry operations. These industries are supplied from existing municipal and industrial water supplies delivered through systems now in place.

Other industrial water users are the Tenneco Minerals Corporation, Helca Mining Company and seven hydroelectric power plants. The Tenneco Gold Strike Mine and the Helca Mine use water for leaching operations. Total use is less than 100 acre-feet annually. The hydroelectric power plants have an installed capacity of 6,610 kilowatts. Other power plants may be constructed in future. Industrial water use demands are not expected to increase significantly.

2.19 Groundwater

Groundwater supplies and use and related problems are discussed in Section 19. Groundwater is the primary source of municipal and industrial water. The principal aquifer is the Navajo sandstone. The long-term annual recharge in the Virgin River basin is estimated to be the same as the discharge of 155,000 acre-feet. Recharge and discharge for the Kanab Creek and Johnson Wash drainages is estimated at 31,000 acre-feet. Groundwater inflow from the Sevier River Basin is estimated at 16,500 acre-feet annually.

Discharge to streams is about 35,800-57,700 acre-feet. Discharge to springs is about 10 percent of these estimates. Long-term discharge from wells has been about 10,900 acre-feet in the Virgin River drainage, although this amount can vary considerably. The 1975-85 average for the

Virgin River drainage was 19,400 acre-feet with 27,000 acre-feet in 1982. Most of the increase is for M&I water.

The Navajo sandstone is exposed or underlies about three-fourths of the basin. It contains several million acre-feet of recoverable water. The water is generally of excellent quality. Some tests in several wells have shown TDS values ranging from 200 to 1,495 mg/l. There are over 750 wells in the basin. All but two, one near Gunlock and one in Fort Pierce Wash, do not show any long-term rise or fall in the water levels. Wells in the Navajo sandstone yield from 400 to 1,500 gallons per minute. There are nearly 900 springs. The largest is Toquerville Springs with total flows over 30 cfs and 450 mg/l TDS. La Verkin Springs flows about 12 cfs of low quality warm water (9,000 mg/l TDS at 100° F).

Increased demands to meet the needs of an expanding population will require increased use from groundwater aquifers. To avoid mining, monitoring will be required. There is also a need to protect the recharge areas. Planners need to take steps to protect recharge areas from pollution by hazardous spills and by the general population. ■